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A NEW PLIOCENE ALLIGATOR FROM NEBRASKA

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In the summer of 1941 a well-preserved skull and jaws, with some postcranial bones, of an alligator were found by Mr. Ralph Mefferd, of the Frick Laboratories of the American Museum of Natural History. The specimen was found on the George Sawyer Ranch in Cherry County, Nebraska, S.E. $\frac{1}{4}$ Sect. 5, T. 31 N., R. 30 W. It occurred in a series of fresh-water marls and sandy channel deposits at about the middle of the Ash Hollow formation. These deposits rest unconformably upon the basal member of the Ash Hollow of this area, referred to in the field as the "Cap Rock" because of its erosion-resisting ability.

No associated fauna was found with the specimen, although the University of Nebraska collected the type of *Torynobelodon barnumbrowni* from the same deposits less than a quarter of a mile north on the west side of the river.

The appended generalized stratigraphic section illustrates the relationship of these two specimens to the stratigraphic members of the area.

I wish to acknowledge my indebtedness to Mr. Childs Frick for permission to describe this fine specimen, and to Mr. Morris F. Skinner, of the Frick Laboratories, for calling my attention to the specimen and for information regarding its occurrence.

Alligator mefferdi, new species

Named in honor of the discoverer of the type, Mr. Ralph Mefferd.

TYPE: A well-preserved skull with jaws, the arch and spine of a vertebra, several scutes, and a hyoidean bone, F:A.M.N.H. No. 7016.

CHARACTERS: The characters of the genus *Alligator*; external narial aperture broader in proportion to its length than in *A. mississippiensis*, and its anterior portion is nearer the tip of the snout; the lateral margins of this aperture are distinctly elevated above the surrounding skull surface, contrasting with the condition in *A. mississippiensis* and *A. thomsoni*. The superficial channeling of the snout is more pronounced than in any other known alligator. A depression between the anterior portions of the orbits is deeper than in any other alligator and resembles the condition present in the South American caimans.

The premaxillary foramen on the palate is oval instead of pear-shaped as in *A. mississippiensis* and *A. thomsoni*. The palatine fenestrae are more regularly oval than in the two species just mentioned, and their long axes are more nearly parallel with the long axis of the skull.

TYPE LOCALITY AND LEVEL: Cherry County, Nebraska, George Sawyer Ranch; S.E. $\frac{1}{4}$ Sect. 5, T. 31 N., R. 30 W.; upper portion of Ash Hollow formation, Middle Pliocene.

DESCRIPTION OF TYPE MATERIAL

The general form of the skull is similar to that of *Alligator mississippiensis* and *A. sinense*. The external narial aperture is slightly broader in proportion to its

length than in *A. mississippiensis*. The anterior border of the aperture is nearer the tip of the snout, the anterior bar of the premaxillaries being somewhat more slender. The lateral margins of the aperture, especially in their posterior portions, are

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very distinctly elevated above the surrounding areas, much more so than in *A. mississippiensis*, *A. sinense*, or *A. thomsoni*. In this character the species resembles *A. mcgrewi*, from the Nebraska Miocene. The median septum of the aperture is of the usual alligatorid form.

The degree of vertical festooning of the snout is less than in *A. sinense*, while the channeling of the snout is more pronounced than in any other species of *Alligator*. The sutures between the premaxillaries and the nasals are more oblique than in *A. mississippiensis*. The usual alligatorid relations of nasals, prefrontals, and lacrimals, the lacrimals being shut out of contact with the nasals by the anterior extensions of the prefrontals, are definitely present.

The orbits are relatively longer in proportion to their breadth than in *A. sinense*. The inner borders of the orbits are strongly enrolled toward the midline of the skull along the entire length of the orbits, making two prominent ridges. These ridges almost meet each other near the central points of the orbits and then diverge in the anterior direction, partially enclosing a triangular depressed area between the anterior portions of the orbits. This depressed area is comparable to the similar, but posteriorly rounded, depression at the base of the snout in *Caiman crocodilus*. The ridges extend forward on the snout, anterior to the front ends of the orbits, much as in *Crocodylus porosus*. External to these ridges, and parallel with them, are fore and aft depressions, chiefly on the maxillaries, but also partially on the lacrimals.

The anterior part of the snout is distinctly pitted, the posterior part only slightly so, agreeing closely with the condition in *A. mississippiensis*.

The interorbital plate is relatively broader than in the Florida alligator, but is relatively narrower than in *A. thomsoni* and *A. sinense*. The lower postorbital bar, composed of elements of jugal and postorbital bones, is relatively stouter than in *A. mississippiensis*; the lateral temporal fenestrae are similar to those of the latter species.

The supratemporal fenestrae are similar

to those of *A. mississippiensis*, but the interfenestral plate is slightly broader, relatively, and its edges are uprolled more. The supraoccipital bone is shorter and broader than in the Florida alligator and as in that species does not appear on the superior surface of the skull. On the palate the characters of the premaxillary foramen are obscured somewhat by distortion, but the portions of its boundaries that are preserved indicate that it was oval rather than pear-shaped as in *A. mississippiensis* and *A. thomsoni*. It is relatively larger than in *A. sinense*.

The palatine fenestrae are long and narrow. They are longer in proportion to their breadth than in *A. sinense*. They appear to be more regularly oval than in *A. mississippiensis* and *A. thomsoni*. Their long axes are more nearly parallel with the long axis of the skull than in those species. The internal narial aperture is relatively large; its postero-external borders are elevated into distinct ridges.

The posterior processes of the premaxillaries are less acute than in *A. sinense*. Each premaxillary bone contains five alveoli. Of these the first and second are very small, the fifth is slightly larger than these, the third is substantially larger than the fifth, and the fourth is much larger than the third; the fourth is also equal in size to, if not larger than, the fourth maxillary alveolus.

This is in contrast with the condition in *A. mississippiensis*, in which the third and fourth premaxillary alveoli are approximately equal in size; it is in agreement, however, with the condition in *A. thomsoni*. The fourth premaxillary tooth of the left side is preserved. It agrees in characters with the corresponding tooth of *A. thomsoni*, being short and stout; it is shorter than the fourth premaxillary tooth of *A. mississippiensis*.

The short maxillo-nasal sutures resemble those of *A. sinense*. There appear to be 14 alveoli in each maxillary. These increase in size regularly from the first, which is very small, to the fourth, which is the largest in the skull. These four are closely spaced as in most alligators. The fifth is equal in size to the second and is distinctly separated

from the fourth. The sixth, seventh, and eighth alveoli are small and are close together, although they are not confluent. Posterior to the eighth the alveoli are of moderate size and are essentially confluent with each other. The ninth, tenth, and eleventh teeth of the right maxillary are preserved, also all of the teeth of the left maxillary except the ninth and the fourteenth. The first maxillary tooth is very small. It is slender in proportion to its height. It is rather bluntly curved and it appears to bend rather abruptly inward near the tip; it is faintly bladed on its anterior and posterior edges. The second tooth is distinctly larger than the first, and its crown is somewhat triangular in shape. It is comparatively thin and is distinctly bladed on its anterior and posterior margins; it is sharp, is slightly curved inward, and exhibits very faint striations.

The third maxillary tooth resembles the second in most characters except that it is much larger; its striations are less distinct—in fact they are scarcely distinguishable. The surface of the crown near the tip is slightly roughened. The blades are very distinct, the anterior blade being particularly so; the constriction near the anterior edge to form the blade is great enough to produce a distinct groove on the antero-internal surface of the tooth. The large fourth tooth bears a distinct resemblance to the third except that it is much larger. The groove setting off the anterior blade from the internal surface is somewhat more conspicuous. This tooth, which is definitely the largest in the series, is less rounded in cross section than the corresponding tooth in *A. mississippiensis*.

The fifth tooth, present on the left side, is an immature tooth that had recently replaced a predecessor, and only the tip is visible. It resembles the second somewhat in size and characters, but is slightly more stoutly constructed, and is more distinctly striated. The sixth maxillary tooth is small and blade-like; it is distinctly striated and its lateral dimension is very small. The seventh maxillary tooth resembles the sixth in all essential characters. The eighth is not preserved on either side of the specimen. The ninth, tenth, and eleventh are

present on both sides, and the twelfth and thirteenth are present on the left side only. These teeth are all much larger than the sixth and seventh. They are all short-crowned and flattened; they are blunter than the teeth farther forward, and do not curve inward as the latter do. The ninth is of medium size, the tenth is quite large, more or less equaling the third maxillary tooth in size, and is distinctly exceeded in size only by the fourth. The eleventh, twelfth, and thirteenth maxillary teeth are small, close together, and subequal in size. The fourteenth is not preserved on either side.

The nasal bones extend backward beyond the level of the anterior borders of the orbits. They are separated from each other at their posterior ends by the anterior process of the frontal. They differ in this respect from *A. sinense* and *A. mississippiensis*. The frontal bone is excluded from participation in the anterior borders of the supratemporal fenestrae by a narrow transverse bar of the parietal as in other species of *Alligator*.

The left ramus of the lower jaw is complete, and the right ramus is nearly so. The symphysis extends back to the level of the fifth mandibular teeth. The portion of the jaw posterior to the tooth row is slightly shorter than the tooth row itself. The post-articular process is short. The splenials appear not to reach the symphysis. The extent of festooning of the jaw margins is slight. The external mandibular fenestrae are large.

There were apparently 21 teeth in each ramus. These were arranged in the order of position with respect to size and shape as follows: The first is large, acuminate, distinctly curved inward, and is distinctly bladed on its anterior and posterior edges. The second and third are of moderate size. These teeth are considerably shorter than the first, and the anterior and posterior blades are much less conspicuous. The fourth is the largest tooth in the lower jaw. It is elongate, compressed oval in section, with anterior and posterior blades. All of these teeth are spaced moderately far apart from each other; the fourth is moderately far from the fifth.

TABLE 1

MEASUREMENTS OF *Alligator mefferdi*, NEW SPECIES, F.A.M.N.H. No. 7016
(Measurements in millimeters)

Length of skull, tip of snout to supraoccipital.....	287
Length of skull, tip of snout to occipital condyle.....	298
Length of snout.....	171
Length of right orbit.....	63
Length of left orbit.....	63
Length of external narial aperture.....	34
Length of left supratemporal fenestra.....	22
Length of cranial table.....	57
Breadth of skull across premaxillary-maxillary suture at sides.....	93
Breadth at fourth maxillary teeth.....	123
Breadth of snout at base.....	135
Breadth of interorbital plate.....	27
Breadth of right orbit.....	38
Breadth of left orbit.....	41
Breadth of left supratemporal fenestra.....	29
Breadth of skull across quadrates (estimated from one side).....	170
Breadth of interfenestral plate.....	10
Breadth of cranial table, anterior end (estimated from one side).....	85
Breadth of cranial table, posterior end (estimated from one side).....	86
Breadth of parietal bone along posterior border of cranial table.....	34
Length of palate, tip of snout to anterior ends of palatine fenestrae.....	134
Length of maxillaries, midline of palate.....	77
Length of palatine, midline.....	94 est.
Length of premaxillary fenestrae.....	27
Length of left palatine fenestra, estimated.....	68
Length of left tooth row (distorted).....	198
Length of right tooth row (distorted).....	200
Length of interfenestral plate between palatine fenestrae.....	35
Length of pterygoid along midline.....	45
Length of internal narial aperture.....	23
Breadth of internal narial aperture.....	15
Breadth of pterygoids.....	123
Length of left ramus of mandible, complete.....	360
Length of left mandibular tooth row.....	176
Length of mandibular symphysis.....	40
Length of external mandibular foramen.....	67
Height of left ramus at external mandibular foramen.....	34
Height of left ramus, maximum.....	67
Breadth of symphysis, maximum.....	71
Breadth of left articular surface.....	37
Length of crown of left fourth maxillary tooth.....	17
Anteroposterior diameter of left fourth maxillary tooth.....	10
Transverse diameter of left fourth maxillary tooth.....	8
Length of crown of left tenth maxillary tooth.....	10
Anteroposterior diameter of left tenth maxillary tooth.....	10
Transverse diameter of left tenth maxillary tooth.....	7
Length of crown of left first mandibular tooth.....	15 est.
Anteroposterior diameter of left first mandibular tooth.....	9
Transverse diameter of left first mandibular tooth.....	6
Length of crown of left fourth mandibular tooth.....	16 est.
Anteroposterior diameter of left fourth mandibular tooth.....	10
Transverse diameter of left fourth mandibular tooth.....	7
Length of crown of right fourth mandibular tooth.....	18
Anteroposterior diameter of right fourth mandibular tooth.....	10
Transverse diameter of left thirteenth mandibular tooth.....	7
Breadth across diapophyses of an anterior dorsal vertebra.....	77
Breadth across prezygapophyses of same.....	40
Breadth across postzygapophyses of same.....	42 est.
Height of spine above neural arch-centrum suture.....	68

The fifth to the eleventh teeth, inclusive, are small; their crowns are triangular and flattened; they are close together, but their alveoli are not confluent. The twelfth, thirteenth, and fourteenth teeth are large, the thirteenth approaching the fourth in size. These teeth have crowns of only moderate height, but their anteroposterior

dimensions are great so that their external surfaces are large. Posterior to the fourteenth the teeth are all low crowned, flat, with their crowns longer anteroposteriorly than they are high. They become progressively lower and blunter in the posterior direction. The alveoli of these teeth are confluent.

TABLE 2

	RATIOS				
	<i>A. mefferdi</i> F:A.M.N.H. No. 7016	<i>A. thomsoni</i> A.M.N.H. No. 1736	<i>A. mississippiensis</i> A.M.N.H. No. 9043	<i>A. sinense</i> A.M.N.H. No. 23892	<i>A. sinense</i> A.M.N.H. No. 7122
Length of snout					
Length of skull, tip of snout to supraoccipital	0.595	0.540	0.636	0.549	0.640
Length of snout					
Length of skull, tip of snout to occipital condyle	0.577	0.530	0.630	0.539	0.630
Breadth of snout at base					
Length of snout	0.800	0.988	0.682	0.831	0.780

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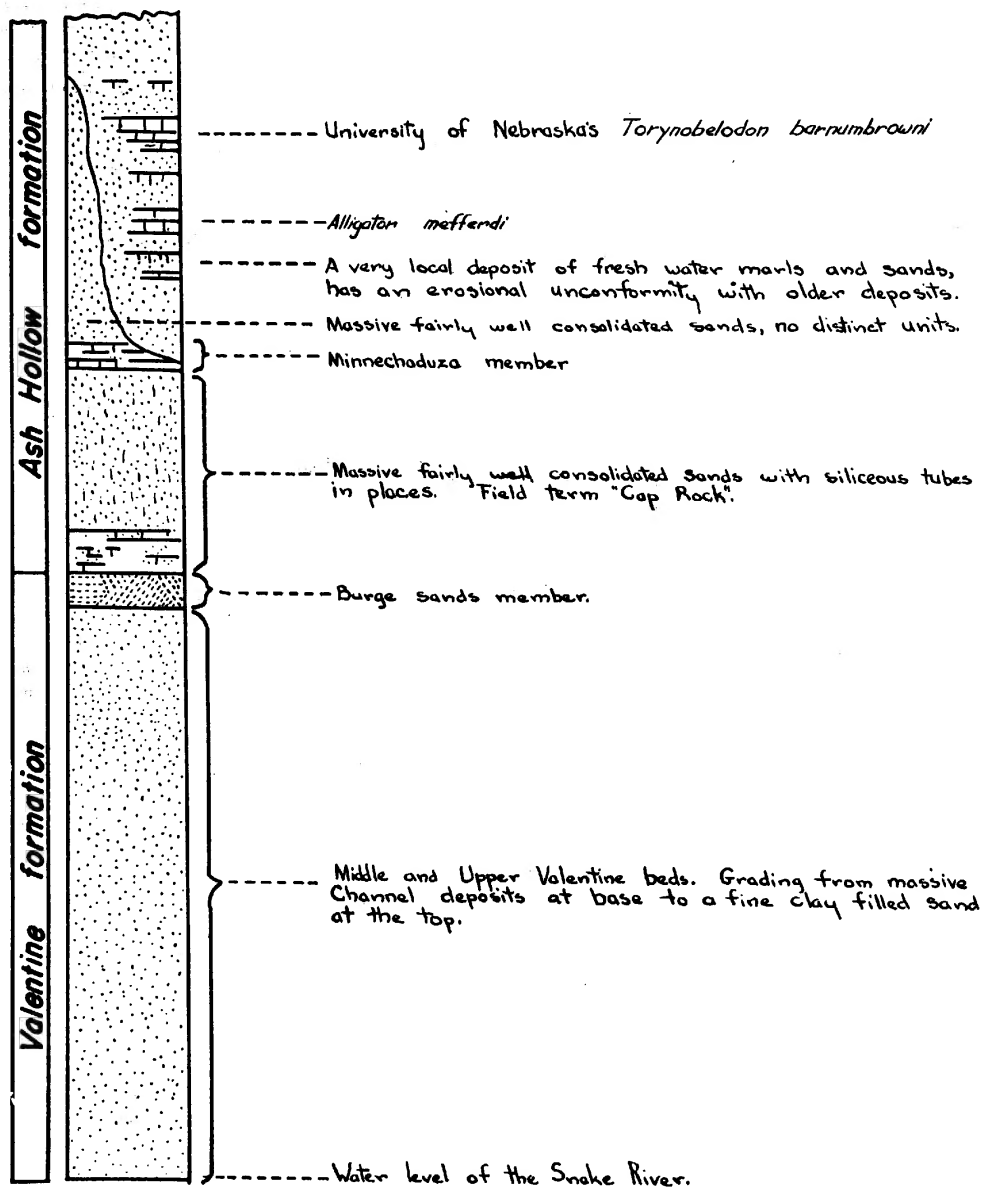


Fig. 1. Stratigraphic column at type locality, Cherry County, Nebraska. Data furnished by Mr. Morris F. Skinner.



Fig. 2. *Alligator mefferdi*, new species. Type, F.A.M.N.H. No. 7016. Skull, superior view, one-half natural size.

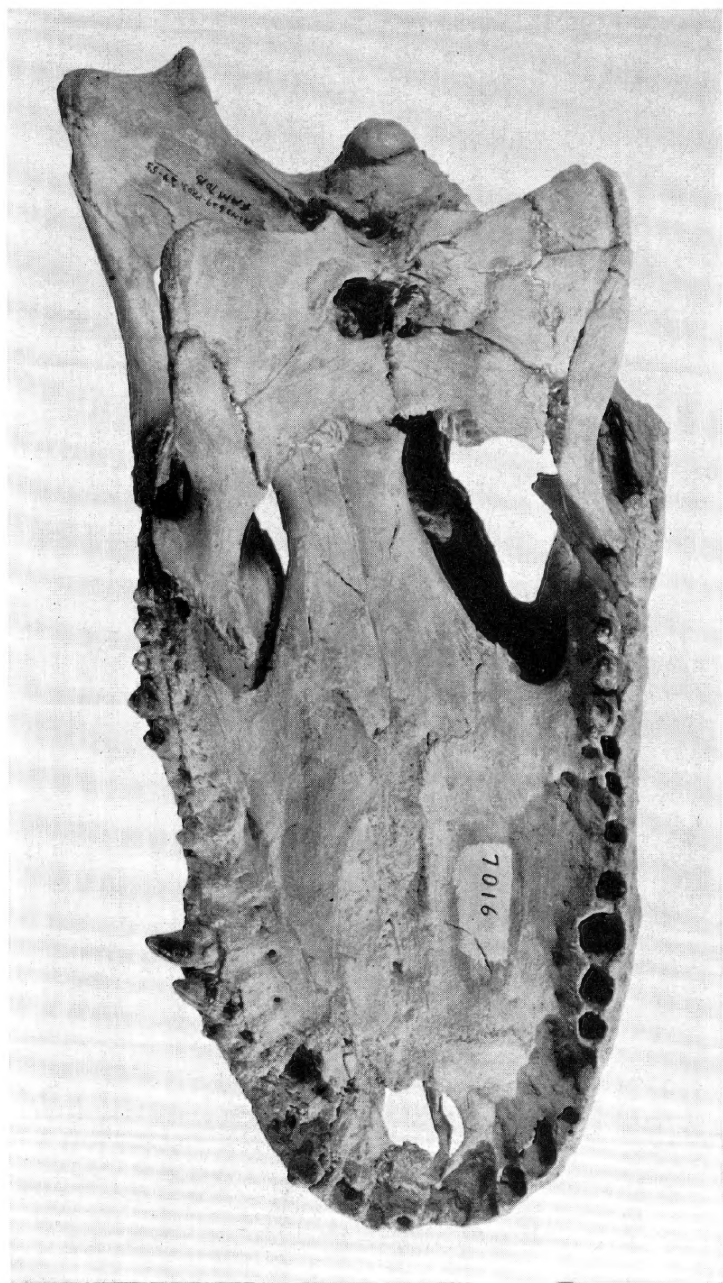


Fig. 3. *Alligator mefferdi*, new species. Type, F.A.M.N.H. No. 7016. Skull, inferior view, one-half natural size.

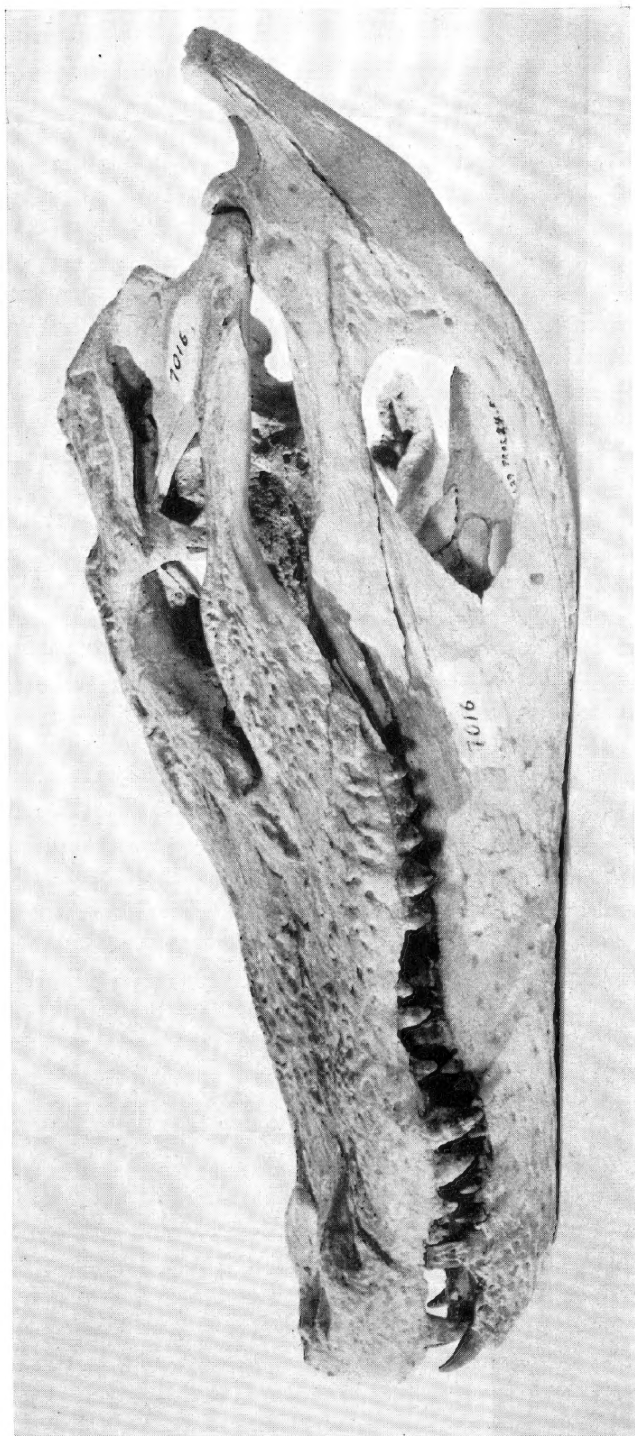


Fig. 4. *Alligator mefferdi*, new species. Type, F.A.M.N.H. No. 7016. Skull and jaws, lateral view, left side, one-half natural size.

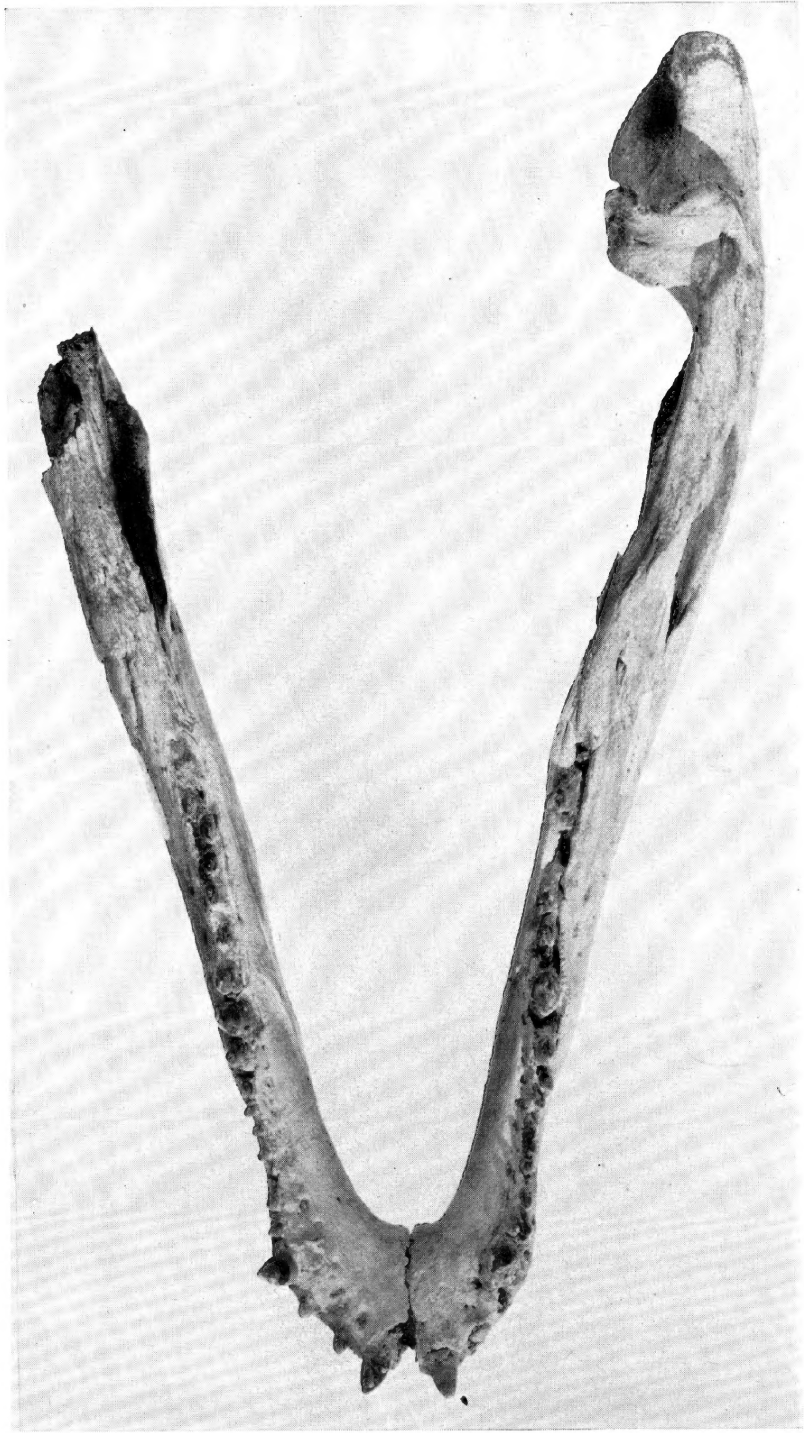


Fig. 5. *Alligator mefferdi*, new species. Type, F.A.M.N.H. No. 7016. Lower jaws, superior view, one-half natural size.

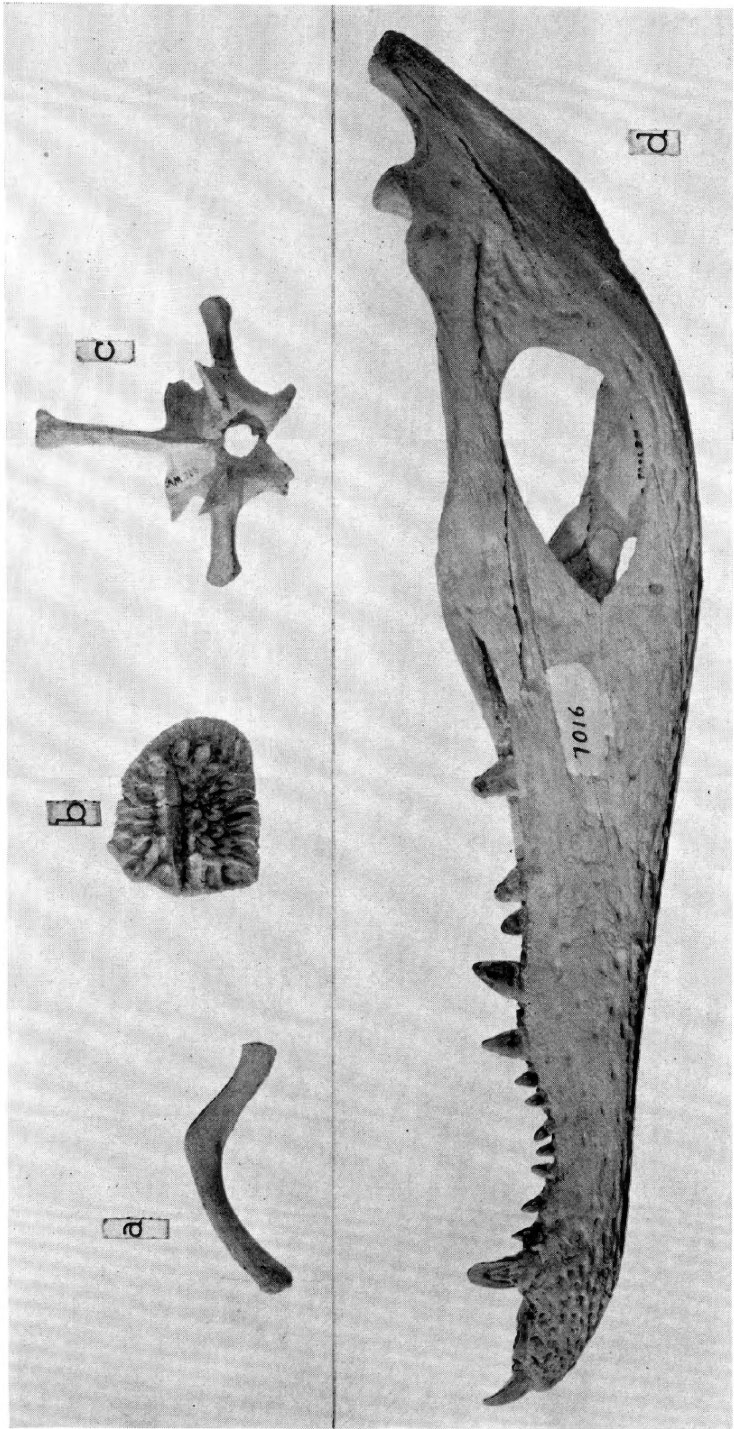


Fig. 6. *Alligator mefferdi*, new species. Type, F.A.M.N.H. No. 7016. a, Hyoidean element; b, nuchal scute; c, arch and spine of a dorsal vertebra; d, left ramus of mandible, external view; all figures one-half natural size.

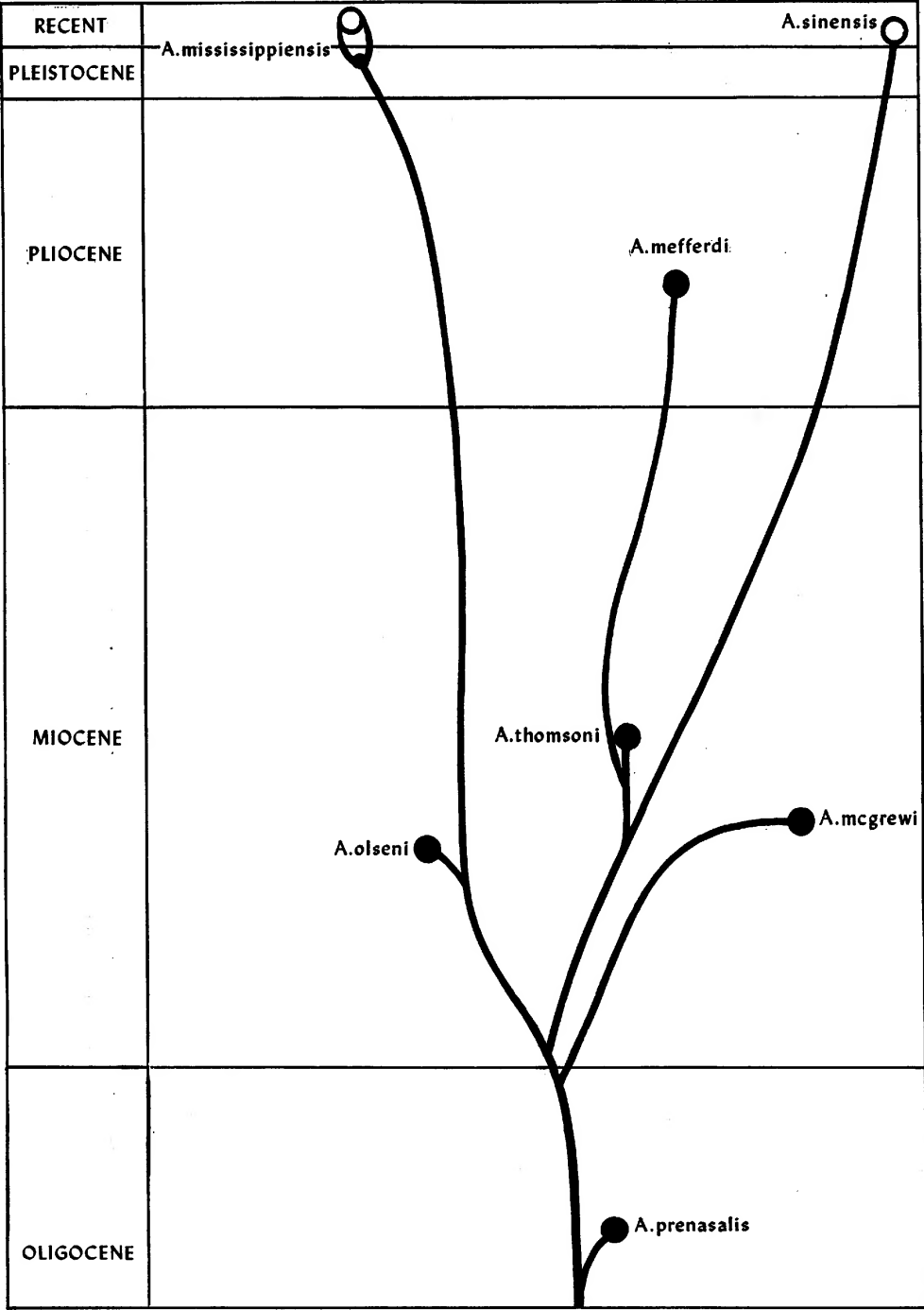


Fig. 7. Interpretation of the phylogenetic relations of species of the genus *Alligator*.